Vowel quality and iconic lengthening[1]

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Abstract. In spoken language it is possible to modulate the length of a given vowel in order to convey a strengthened meaning, e.g. in "looong talk" the the denoted talk is longer than in "long talk. This very same lengthening is not felicitous for adjectives like short (* "shooort"). For this reason, the lengthening of "large"-type adjectives like "long" is usually held to be purely iconic (Schlenker 2016, Fuchs et al 2019), i.e. the result of a direct mapping from, e.g., the length of the talk to the length of the word "long". Still, for adjectives like "teeny", the lengthening is possible. Consequently, I argue that to account for iconic modulation of vowel length it is necessary to consider, alongside 'pure' iconicity, the back/front opposition of vowels, one of the most robust phenomena linked to sound symbolism. I submit that two mechanisms underlie modulation of vowel length: i) '**Pure' iconicity**, mapping the length (or number of replications) of the vowel directly onto the size of the object of which the adjective is predicated, thus applying to 'large'-type words only. ii) **Intensification of the vowel symbolism**, placing restrictions on the lengthenable vowel requiring the vowel type (back/ front) to 'match' with the semantic direction of the adjective ('large'-type/'small'-type respectively). I present two pilot studies that test acceptability judgements on scalar adjectives whose stressed vowel has been lengthened. The studies are underpowered, but there is a consistent trend that goes in the direction of our predictions.

Keywords: iconic lengthening, vowel symbolism, iconic enrichments.

1. Introduction

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In language, both spoken and signed, it is possible to modulate the length of a given sound or sign in order to convey a strengthened meaning, like in (1).

(1) I am normally rather patient. But if the talk is loooong, I'll leave before the end.
≠> if the talk is long, the speaker will leave before the end
=> if the talk is very long, the speaker will leave before the end.

One semantic domain in which such modulations are particularly frequent is that of scalar adjectives. In formal semantics they have been analyzed as functions from individuals to degrees on scales (Bierwisch 1987, Kennedy 1999, 2007). This semantic class is a good place to test iconicity: sizes and scales are more easily mappable to dimensions of language like duration (spoken language) and amplitude (sign language) than other semantic areas. For instance, in Italian Sign Language adjectival scales can be iconically characterized in signing space (Aristodemo and Geraci 2018).

2. A non-trivial interaction between iconic lengthening and vowel quality

The modulations of interest can target the at-issue component of the clause (Okrent 2002, Schlenker 2016). This is particularly clear with scalar adjectives, as remarked above. *Prima facie*, there seem to be two competing theories accounting for such vowel lengthening:

> **Theory I. Intensification**: The length of the object to which "long" applies is smaller than the length of the object to which "looong" applies exclusively by reason of an intensification effect, similar to when "very" is repeated before an adjective to strengthen its meaning.

On this theory, lengthening works like stress in the traditional analysis. Kennedy 2007 linked prosodic stress to a systematically raised standard in *all* gradable adjectives. The scale associated with the scalar adjective *tall* is a height scale (Kennedy 1999, 2007). The adjective communicates that its argument falls above (or below) some threshold on this scale. Consider for example sentence (2):

> (1) John is tall. [Understood meaning: The man's height is greater than a normal standard.]

Scalar adjectives are context-dependent. Thus if we speak of a basketball player, the threshold will be of something like 210 cm, the average height of basketball players. Scalar adjectives are also underspecified: while the scale is fixed in advance, the threshold and its precise value are not. Stress can be used to systematically strengthen the interpretation of gradable adjectives in both semantic directions ("small"-type and "large"-type) (Kennedy 2007). When an adjective is under stress, depending on its semantic direction the standard of the adjective will be interpreted as especially high (as for example for "tall") or low (for "short"):

> (2) Bob is TALL.
> (3) The watch is EXPENSIVE.

One can see that the effect is quite general, in that it appears whenever stress is applied to a lower- or upper-bounding adjective in a predicative setting[3].

However, **Theory I** is neither explanatorily nor descriptively adequate in that lengthening at least doesn't seem to be as productive as word stress. Thus (4), unlike (4), is infelicitous.

(4) a.?? The talk was shooort. (Schlenker 2016)
b. The talk was SHORT.

On these grounds, Schlenker (2016) suggests that a 'pure' version of iconicity might better explain modulation of vowel length:

> **Theory II. Iconicity and direct mapping:** the length of the vowel, in virtue of its iconic effect, is a direct mapping of the length of the talk.

In other words, **every sound unit maps onto a signified extra size unit.** This seems to be confirmed by corpus studies.Fuchs et al (2019), for instance, examined 10 antonym pairs in an English social media corpus in order to investigate whether bloggers replicate letters more frequently in adjectives associated with a greater size or spatial/temporal extent. Among the antonyms compared, it was always the "large"-type adjective that featured more letter replications. The study did not find any effect of sound symbolism on lengthening in the antonym pairs. In sum, the results of Fuchs et al (2019) seem to point in the direction of **'**pure' iconicity.

However, Theory II cannot explain the data in (5) and (5), since 'pure' iconicity predicts that it should not be possible for the length of a vowel to be *inversely* proportional to the size of the denoted object.

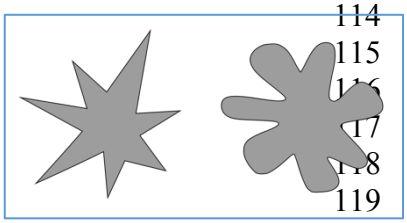
(5) a. **ENG** That mouse is teeeeny.
b. **ITA** Quel topo è piiiccolo.[4]

Given the data so far reviewed, one hypothesis worth investigating is that the conditions of felicity of iconic lengthening and the quality of the lengthened vowel interact non-trivially. In this connection, note the difference in felicity between (4a) and (5a).

There is indeed a large set of sound-meaning associations generally described as sound symbolism. One of the most robust among these is the connection between back vowels and words semantically related to largeness, and similarly for front vowels and smallness. Already Köhler (1929) made a case for a predecessor of what is known as the bouba/kiki effect. This effect involves a non-arbitrary connection between the word *bouba* and the right

[3]There are of course many other readings of stress, such as contrast and correction, which do not concern us in this article.

[4] Italian data are drawn from my introspective judgments and discussions with three other native speakers.



shape and the word *kiki* and the left shape (see image). Köhler argued that given the pair of words *takete* and *baluma*, *takete* will be typically associated with sharp shapes, whereas *baluma* will match with blob-like features. He linked this to the difference between back and front vowel. Sapir (1929) corroborated this intuition, showing that English speakers agree to a large extent when comparing non-words that differ exclusively in the back vs front character of the vowel, e.g. in considering [gɔl] to be larger than [gil].

Since Sapir, the back/front opposition and the related symbolism have been investigated at length. To cite only a few studies, Thomson and Estes (2001) showed that the size-vowel height link is a graded function: in a task of novel naming of objects, the size of the object linearly predicted the number of back-vowel phonemes in its preferred name. Cross-linguistic work has established strong back/front large/small trends in a large number of existing languages and across unrelated families (Johnson, 1967; Ohala, 1984; Ultan, 1978). A similar cognitive tendency can be observed in the association in phonological form between front and back vowels and the words 'here' and 'there'. See for instance Italian *qui*, 'here,' vs. *là*, 'there' (Ultan 1978).

Coming back to iconic lengthening, how might the proposed interaction with vowel quality take place? At first glance, one might think that because of the felicity of (5) and (5), an *intensification of the vowel symbolism* suffices to explain the data. In other words, one might submit that the iconic lengthening intensifies the effect of the vowel symbolism equally and in both directions. The felicity of (5) in the face of the infelicity of (4) militates for this hypothesis. Moreover, "looong" in (6) seems introspectively more felicitous than "thiiick" in (6).

(6) a. This talk is looong.
b. This slice is thiiick.

However, precisely these two facts highlight an asymmetry. Iconically lengthening the back vowel in "small"-type adjectives makes the sentence infelicitous. On the other hand, the lengthening of the front vowel in "large"-type adjectives does not affect the felicity of the sentence (6b): it is merely less felicitous than the lengthening of the back vowel as in (6a).

	Words with back vowel as stressed vowel	Words with front vowel as stressed vowel
"large"-type meaning	Felicitous	Felicitous, but less than "large"-type × back vowel.
"small"-type meaning	Infelicitous	Felicitous

The overall higher acceptability of lengthening in 'long'-type words ("biiig" seems to be better than "shooort", although neither seems to feature any symbolism) creates an **asymmetry** that calls for a **mixed theory**.

I submit that two mechanisms underlie modulation of vowel length:

- '**Pure' iconicity**, mapping the length (or number of replications) of the vowel directly onto the size of the object of which the adjective is predicated, thus applying to 'large'-type words only. This is the mapping in which a longer realisation of the vowel denotes a smaller intended meaning is an inverse one.
- **Iconic intensification**, placing restrictions on the lengthenable vowel requiring the vowel type (back/ front) to 'match' with the semantic direction of the adjective ('large'-type/'small'-type respectively). This is not intensification of the conventional Kennedy-type focus meaning (i.e., the standard is always raised in "large"-type adjectives and lowered in "small"-type adjectives), but rather intensification *of the sound symbolism*, i.e., of the vocal gesture that produces the sound.

Table 1 Outline of our hypothesis: sub-mechanisms at work in the four conditions
vowel-type (back/front) × word-type ("large"/"small").
- 'large'-type×back vowel: 'pure' iconicity is involved because a direct mapping from the length of the word to the size of the predicated object is possible. Moreover, iconic intensification applies because back vowels symbolically correspond to bigger meanings. I expect this to be the most acceptable condition for lengthening.
- 'large-type×front vowel: 'pure iconicity is involved, for the same reasons as above. Iconic intensification does not apply because vowel type and meaning do not match. I expect average acceptability.
- 'small-type×front vowel: no pure iconicity is involved: the longer the word, the *smaller* the referred object. Iconic intensification applies because front vowels symbolically match with "small"-type meanings.
- small-type×back vowel: no pure iconicity applies for the same reasons as above, and no vowel-meaning match. I expect the acceptability to be lowest in this condition.

	Back vowel as stressed vowel	Front vowel as stressed vowel
'large'-type	Pure iconicity + iconic intensification	Pure iconicity
'small'-type	ø	Iconic intensification

The predictions can be laid out precisely:

- The large'-type×back vowel condition should elicit higher acceptability judgments than the 'large-type×front vowel condition:
  Pure iconicity + iconic intensification > Pure iconicity

- The large'-type×back vowel condition should elicit higher acceptability judgments than the small-type×front vowel condition:
  Pure iconicity + iconic intensification > Iconic intensification

- The 'large-type×front vowel should elicit higher acceptability judgments than the small-type×back vowel condition:
  Pure iconicity > ø

- The small-type×front vowel should elicit higher acceptability judgments than the small-type×back vowel condition:
  Iconic intensification > ø

3. Pilot experiments

To assess the plausibility of this theory, I ran two pilot experiments. In **Pilot #1**, participants were 14 native speakers of Italian aged 19-50 recruited from my social circle. Subjects had to give acceptability judgements from 1"least acceptable" to 7 "most acceptable", for 28 written adjectives (corresponding to 14 couples of antonyms) whose tonic vowel was iterated three times. In **Pilot #2,** participants were 15 Italian native speakers aged 19-65 equally recruited from our social circle. Subjects had to give acceptability judgements from 1 to 7 for 28 audio recordings (the adjectives corresponded to 14 couples of antonyms) whose tonic vowel was pronounced lengthened. Order was randomized for all subjects in both pilots. I predicted two main outputs: **1)** that, overall, the acceptability judgements on 'large'-type words outscore those on 'small'-type words, **2)** that vowels with a symbolism going in the semantic direction of the adjective (back vowels and 'large'-type, front vowels and 'small'-type) could be intensified with significantly higher acceptability than those going in the opposite direction. More specifically, where possible, I provided controls for the vowel quality: synonyms featuring a different vowel type (back/front) were provided in order to provide insight in the variation within the same semantic area.

Antonym pairs		
[+]	English transl.	[-]
Luuungo	long/short	Cooorto
Graaande	big/small	Piiiccolo
Graaasso	fat/skinny	Smiiilzo
		Striminziiito
		Maaagro
Meeega	mega/micro	Miiicro
Giiiga		
Grooosso	thick/thin	Sottiiile
Lontaaano	far/close	Viciiino
Laaargo	broad/narrow	Streeetto
Leeento	slow/fast	Sveeelto
		Velooooce
Aaalto	high/low	Baaasso
Enooorme, Gigantrooopico,	enormous/teeny	Picciiino Piccoliiino

4. Results and discussion

4.1 Descriptive

Results showed higher overall acceptability judgements for lengthening of 'large'-type adjectives (referred to by "[+]"-adjectives in the graphs) in both the written and the spoken test cf. Graph 1-4 in Appendix 1. Moreover, prosodic lengthening in spoken language received overall higher judgements than written letter replication. Likewise, results showed higher acceptability judgements for lengthening when vowel and meaning "matched", both in 'large'-type and 'small'-type direction. Much higher acceptability judgements were also given when **i** matched with a strict smallness (only words that specifically mean "small") meaning and **a, o, u** matched with a strict bigness meaning. Cf. Graph 5 and 6 in appendix 1 for pilot 1 and pilot 2 respectively.

4.2 Correlation

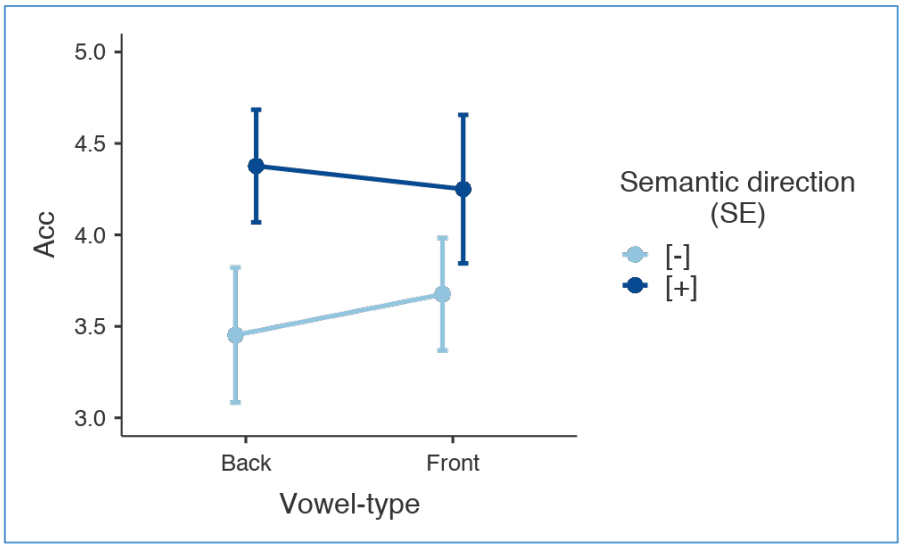
The design was bound to be unbalanced, as there are much fewer items in the condition "large"-type × front vowel than in the condition "large"-type × back vowel.[5] Moreover, there are fewer items in the condition "small"-type×back vowel than in the condition "small"-type×front vowel. One way of controlling for this in future research would be to configure the experiment as a novel naming task, which already proved very useful in works like Thomson and Estes (2001).

Data were analyzed through linear mixed models (see appendix 2 for details). As expected, the linear mixed effects models were far too underpowered to yield a significant result. I take these pilots as suggestive of a trend in the predicted direction. See Graph A and Graph B below ("large"-type adjectives are again referred to by "[+]"):

[5] As already mentioned, the unbalanced lexical distribution seems to be crosslinguistically linked to the symbolism itself. See (Johnson, 1967; Ohala, 1984; Ultan, 1978).

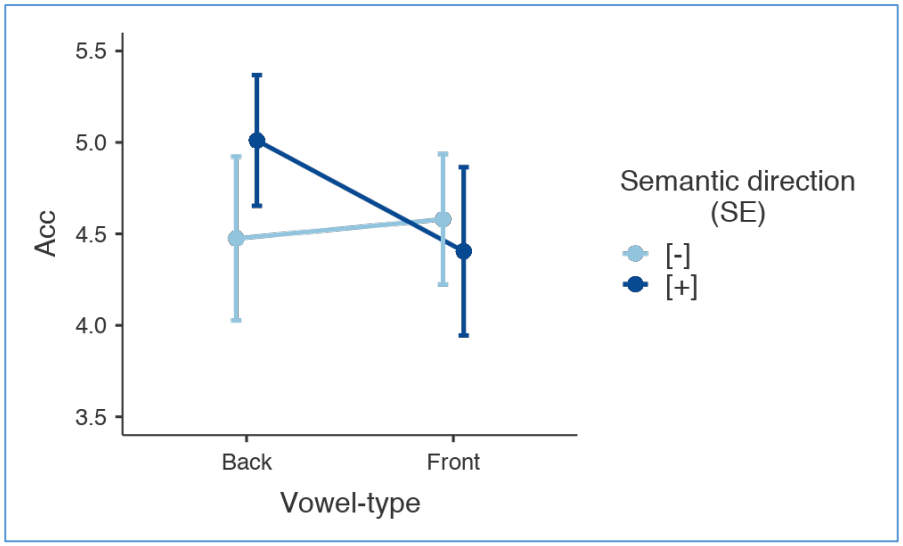
GRAPH A. Pilot 1 (written task): Mixed linear model results and plot. I leave a deeper experimental investigation of these facts to future work

	F	Num df	Den df	p
Semantic direction	12.9246	1	361	< .001
Vowel-type	0.0534	1	361	0.817
Semantic direction ✻ Vowel-type	0.7029	1	361	0.402



GRAPH B. Pilot 2 (audio recording task): Mixed linear model results and plot.

	F	Num df	Den df	p
Semantic direction	0.543	1	304	0.462
Vowel-type	1.047	1	304	0.307
Semantic direction ✻ Vowel-type	2.123	1	304	0.146



Overall:

i) Lengthening in 'large'-type words received globally higher acceptability judgements.
ii) Stressed vowel lengthening received higher acceptability judgements when vowel and meaning "matched" compared to when vowel and meaning did not match.

thus being in line with the predictions of our two-factor theory: the sub-mechanism of 'pure' iconicity explains i) while iconic intensification explains ii).

4.3 Iconicity, symbolism, and meaning-relevance

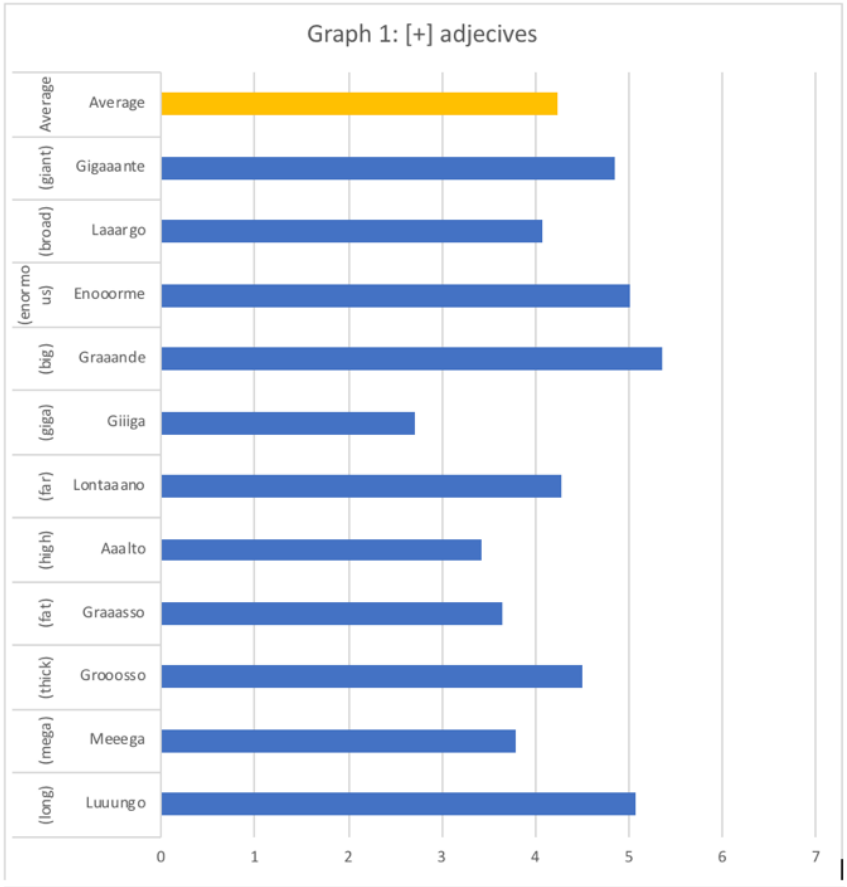
The iconic effect behind the back/front opposition has been claimed to arise in virtue of the relative position of palate and tongue (close in the case of front vowels, apart in the case of back vowels) and «by the spatial or dimensional meaning of these speech sounds» (Fischer 1999). In other words, the bodily movement producing the vowel *preserves some structural properties of the object* to which the word containing the vowel refers, just like iconic lengthening does.

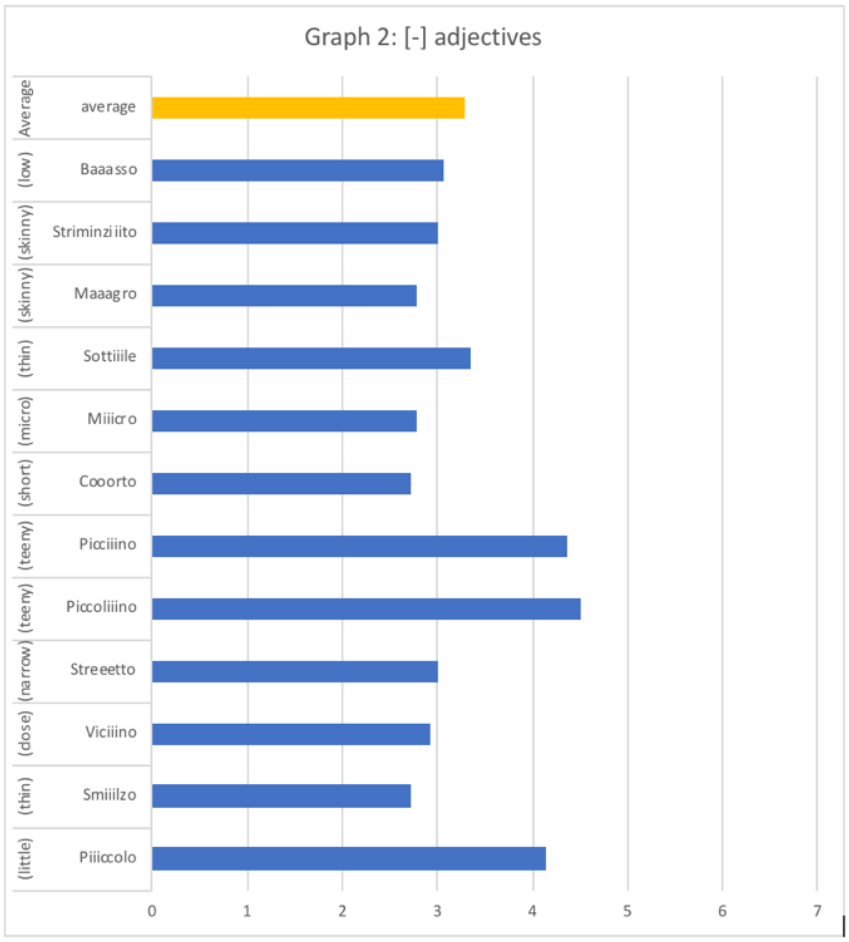
Why is lengthening so strikingly more productive than quality-related symbolism? Vowel length displays arbitrary productiveness and a mapping onto a continuous scale, whereas vowel quality exhibits limited productivity and **categorical perception** due to the categorization of allophones in the same phonemic categories**.** This results in a mapping onto a discrete scale: /i/ maps broadly onto small things, while /a/ maps onto big things. A reasonable hypothesis, to be tested in future research, is that this difference can be boiled down to phonemic meaning-relevance. In Italian and English vowel length is not meaning-relevant, while vowel quality is. I submit that this explains the category constraints found within vowel symbolism. For instance, the vowel in "big" can be lengthened to raise the standard of the predicated bigness. But for this same purpose the vowel can't be made more back: "bag" is just a different word. Thus knowing the meaning-relevant phonetic features of a language might make it possible to predict the productivity of iconic lengthening and of (at-issue) vowel symbolism.

5. Conclusion

In this paper, I argued that 'pure' iconicity is not enough to account for iconic lengthening. More specifically, I have suggested that there are two mechanisms at work: 'pure' iconicity, a direct mapping from the length of the vowel to the size of the object referred to by the adjective, and intensification of the sound symbolism that associates back vowels to "large"-type meanings and front vowels to "small"-type meanings. I have presented two small pilots whose results I take as suggestive of a trend in the predicted direction, and I leave a deeper experimental investigation of these facts to future work.

APPENDIX 1: DESCRIPTIVE STATISTICS





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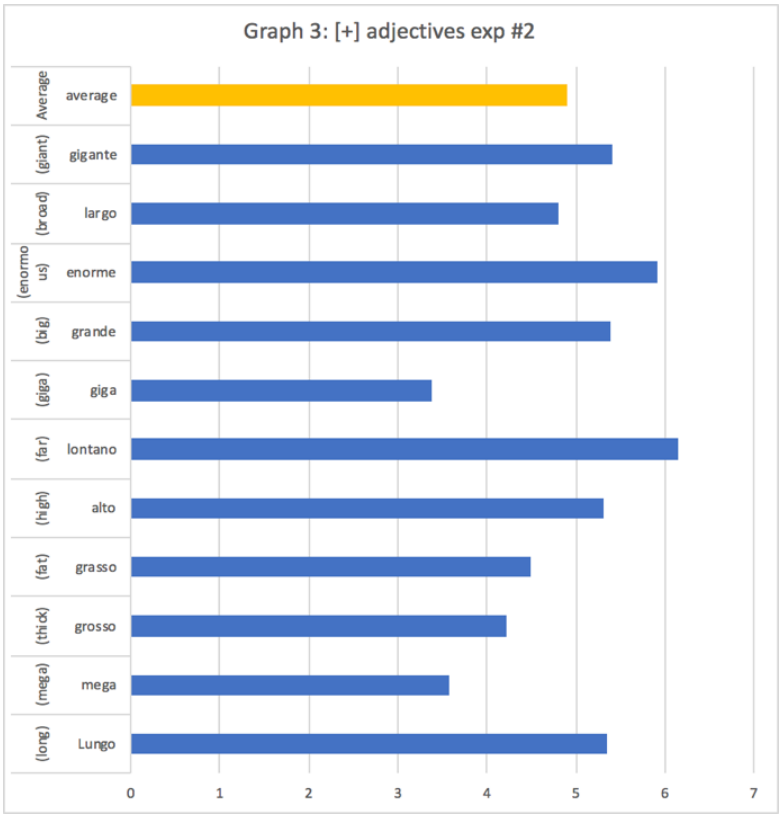

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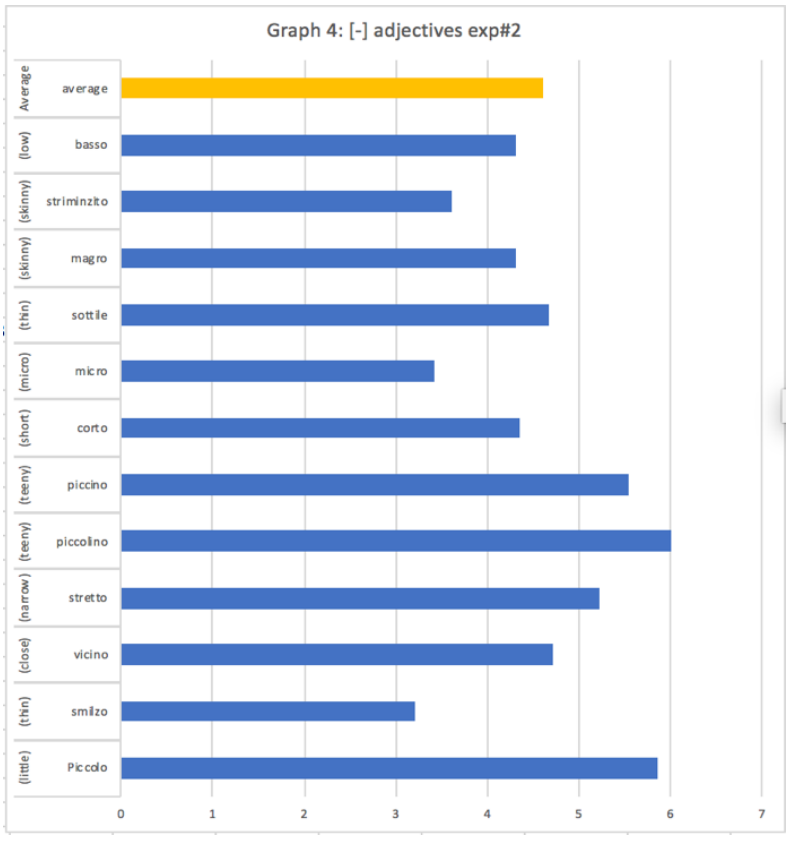

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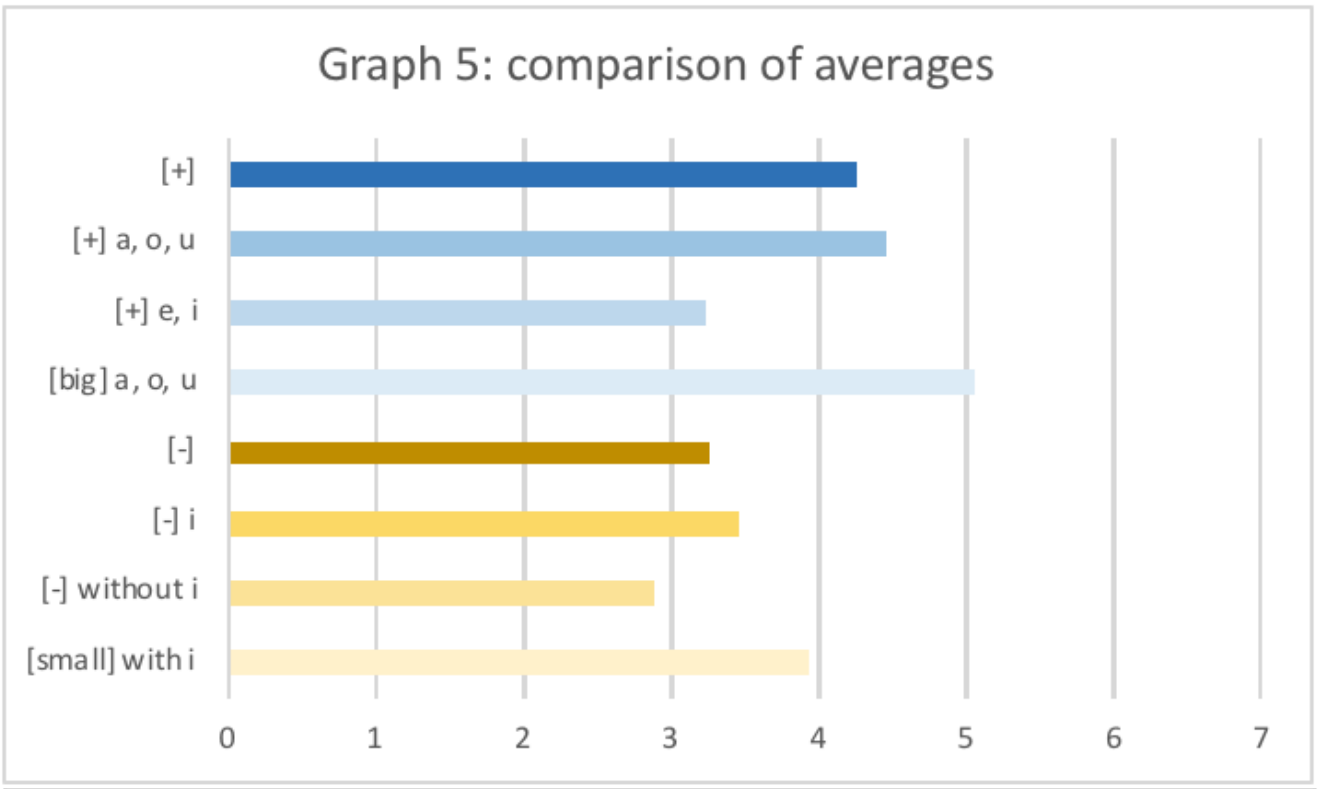
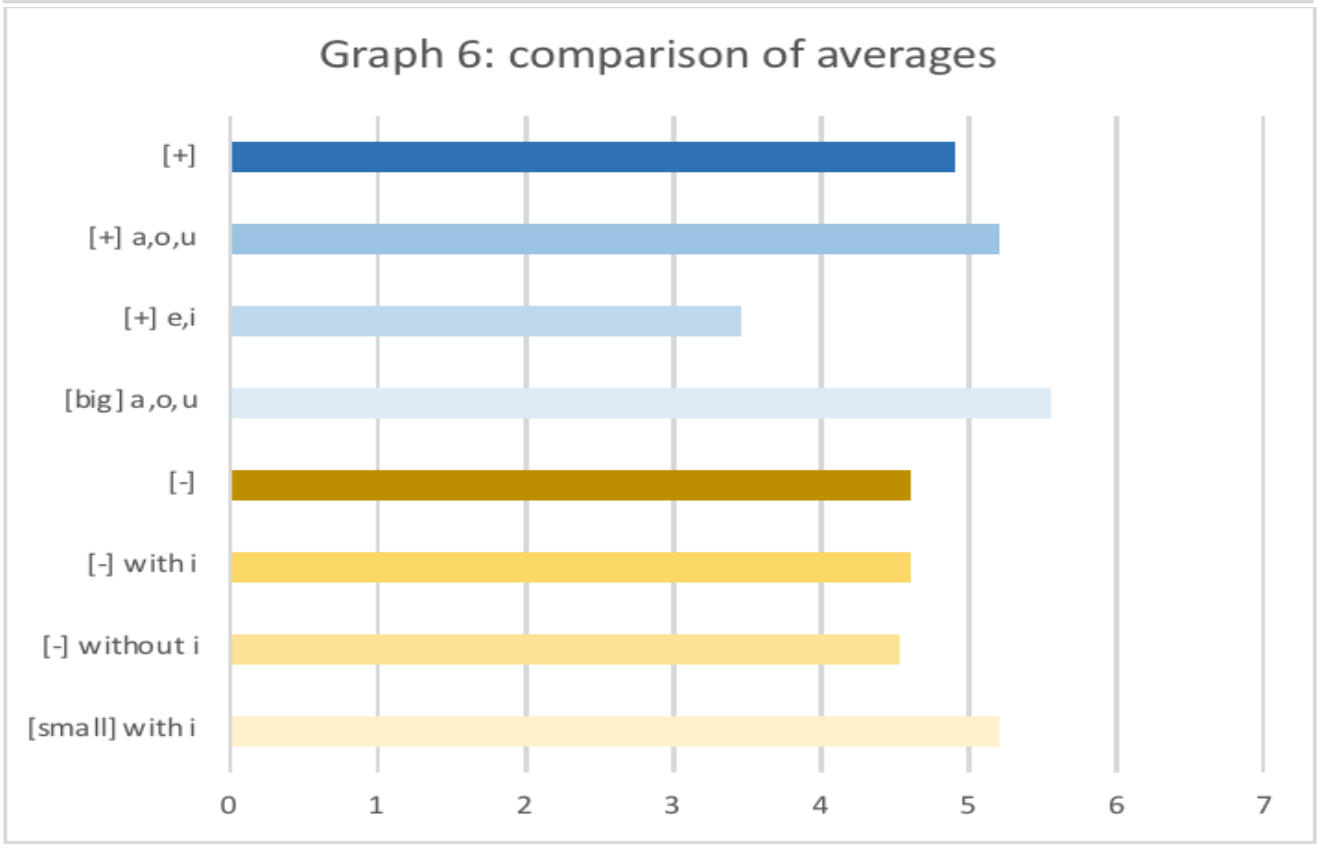

Graph 5: comparison of averages
[+]
[+] a, o, u
[+] e, i
[big] a, o, u
[-]
[-] i
[-] without i
[small] with i
0
1
2
3
4
5
6
7


Graph 6: comparison of averages
[+]
[+] a,o,u
[+] e,i
[big] a,o,u
[-]
[-] with i
[-] without i
[small] with i
0
1
2
3
4
5
6
7

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APPENDIX 2: INFORMATION ON LINEAR MIXED MODEL

Pilot 1:

Model Info

Info	
Estimate	Linear mixed model fit by REML
Call	Acc ~ 1 + Semantic direction + Vowel-type + Semantic direction:Vowel-type+(1|Subject)
AIC	1444.8860
R-squared Marginal	0.0380
R-squared Conditional	0.3421

Fixed Effects Parameter Estimates

				95% Confidence Interval				
Names	Effect	Estimate	SE	Lower	Upper	df	t	p
(Intercept)	(Intercept)	3.9386	0.300	3.351	4.527	14.4	13.127	< .001
Semantic direction1	[-] - ([+], [-])	-0.3747	0.104	-0.579	-0.170	361.0	-3.595	< .001
Vowel-type1	Front - (Back, Front)	0.0241	0.104	-0.180	0.228	361.0	0.231	0.817
Semantic direction1 ✻ Vowel-type1	[-] - ([+], [-]) ✻ Front - (Back, Front)	0.0874	0.104	-0.117	0.292	361.0	0.838	0.402

Pilot 2

Model Info

Info	
Estimate	Linear mixed model fit by REML
Call	Acc ~ 1 + Semantic direction + Vowel-type + Semantic direction:Vowel-type+(1|Subject)
AIC	1268.6984
R-squared Marginal	0.0132
R-squared Conditional	0.3622

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